Unit 2

Seed Selection and Seedling Production

Introduction

Seed is a fundamental requirement to grow most crops. In a broad sense, it is that part of a plant which is used for propagation, planting, or regeneration purpose. Vegetable seeds are costly and their wastage during sowing or handling increases the cost of cultivation. Healthy and good quality seeds lead to a healthy crop. Hence, the selection of seeds is crucial. Only quality seeds that are sown, according to the instructions set by the National Food Corporation, can give a desirable crop yield.

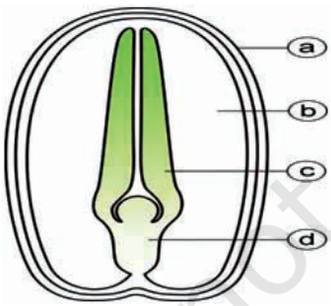


Fig. 2.1: Parts of a seed — (a) Seed coat, (b) Embryo, (c) Plumule bud and (d) Radicle

Session 1: Seed

Seeds can be defined as a dormant embryo (micro-seedling), which develops into a plant when subjected to required environmental conditions.

Parts of seed

A seed comprises the following parts (Fig. 2.1):

(a) Seed coat
(b) Embryo: Cotyledons or endosperm
(c) Plumule bud
(d) Radicle

Seed quality parameters

A seed should be:

- genetically pure
- viable
- containing optimum moisture content
- free from mixture of other seeds
- healthy and free from infection or infestation
- intact, i.e., without any damage to any of its part

Seed producing agencies

Seed production is specialised cultivation of a crop under the supervision of trained personnel or experts. The authorised sources of seeds in the country are:

- Indian Council of Agricultural Research (ICAR) institutions
- State Agricultural Universities (SAUs)
- Sponsored breeders recognised by selected State Seed Corporations
- National Seeds Corporation (NSC)
- State Seeds Corporation (SSC)
- State Farms Corporation of India (SFCI)
- Krishi Vigyan Kendras (KVKs)
- Non-governmental Organisations, etc.

Role of private seed sector

At present, a large number of seed companies are engaged in seed production or seed trade. In case of vegetable seeds and planting material, private sector is the dominant producer in India.

All these parameters are minutely checked and tested during seed certification. So, it is always better to sow only certified seeds.

Characteristics of important varieties

Tomato

The growing habit of tomato differs in two ways.

Determinate type

The growth of some tomato plants terminates in the flower bud. These are also called self-topping or self-pruning type. These plants are comparatively shorter in height with strong stem and several lateral branches. They are mostly of early varieties.

Varieties: Vaishali, Rupali, Rashmi and Pusa Early Dwarf

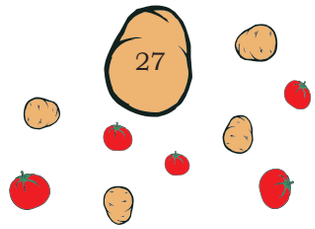


Fig. 2.2: Indeterminate type tomato cultivation

Indeterminate type

These plants terminate in the vegetative bud and show continuous growth, like vines (Fig. 2.2). These are also called vine tomatoes. Their stem is long and weak, hence, they require support and staking. Fruiting is seen on lateral growth. Varieties of this group flower in cluster and fruiting is delayed.

Varieties: Arka Rakshak, Arka Meghali, Arka Samrat, Arka Saurabh and Arka Shreshta

Important varieties

Popular varieties

Pusa Rubi, Pusa Sadabahar, Punjab Chhuhara, Arka Vikash, Hisar Lalit and Pusa Gaurav

Hybrids

Pusa Hybrid–1, Pusa Hybrid–2, Pusa Hybrid–8, Pusa Hybrid–10, Pusa Hybrid–11, ATH–1, ATH–2, Vaishali, Rupali, Sheetal and Ratna

Hybrid varieties: a group of plants grown from seeds produced by cross-pollinating two or more parental breeding stocks.

Varieties for protected cultivation

Indeterminate varieties, like Arka Meghali, Arka Saurabh, Pusa Cherry Tomato–1, Himsona and Himshikhar are developed under protected conditions.

Brinjal

Brinjal is also known as eggplant. Based on the shape and the colour of the fruit, brinjal is classified into three types.

Fig. 2.3: Round-shaped brinjal

Important varieties

Round fruit

Fruits shown in Fig. 2.3 are round type.

Varieties: Pusa Hybrid–6, Pusa Hybrid–9, Pusa Upkar (purple), Arka Kusumakar (green) and Manjari Gota (bicolour)

Fig. 2.4: Long-shaped brinjal

Long fruit

Fruits shown in Fig. 2.4 are long fruited type.

Varieties: Pusa Bhairav, Pusa Hybrid–5, Pusa Kranti, Pusa Purple Cluster, Pusa Purple Long (purple in colour) and Arka Shirish (green in colour)

Small and oval fruits

Fruits shown in Fig. 2.5 are oval type.

Varieties: Arka Navaneet, Bhagyamati, Pusa Uttam and Pusa Bindu — purple in colour; Vaishali (bicolour)

Fig. 2.5: Oval-shaped brinjal

Chilli

Fig. 2.6 and 2.7 depict long and pungent type chilli or hot pepper. Some of these types of chilli are — Pusa Jwala, Pant C–1, Pusa Sadabahar, Andhra Jyoti, Bhagya Laxmi, etc.

Fig. 2.6: Green chilli

Sweet Pepper

This type of chilli is used as a vegetable. It is popularly known as 'Shimla Mirch'. The fruits are of different colours — red (Fig. 2.8), yellow (Fig. 2.9) or green (Fig. 2.10). These are less pungent, bigger in size, broadly ribbed, fleshy with lesser seeds and hollow. Sweet pepper has more demand in foreign markets. The important varieties are — California Wonder, Yolo Wonder, Arka Mohini, Arka Gaurav and King of North.

Fig. 2.7: Red chilli

Potato

Potato are early varieties, mid-season varieties, late varieties and varieties suitable for processing (Fig. 2.11).

Fig. 2.8: Red sweet pepper

Important varieties

Early varieties

Kufri Ashoka, Kufri Chandramukhi and Kufri Surya (heat tolerant)

Fig. 2.9: Yellow sweet pepper

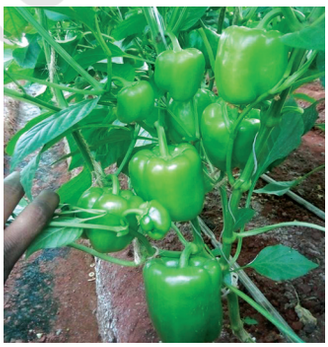


Fig. 2.10: Green sweet pepper

Fig. 2.11: Potato tubers

Mid-season varieties

Kufri Jyoti, Kufri Badshah, Kufri Bahar, Kufri Lalima, Kufri Jawahar, Kufri Sutlej, Kufri Pukharaj and Kufri Giriraj

Varieties suitable for processing

Kufri Chipsona–1, Kufri Chipsona–2 and Kufri Frisona

Late varieties

Kufri Swarna and Kufri Sinduri

Seed rate

The amount of seeds to be used depends upon their purity, viability, planting time, soil conditions, and size and vigour of the plant. Solanaceous crops require different seed rate as shown in Table 2.1.

Table 2.1: Seed rate for solanaceous crops to produce seedlings for one hectare field

Crop	Pure varieties (gm/ha)	Hybrids (gm/ha)
Tomato	400–500	100–150
Brinjal	400–500	150–200
Chilli	1000–1250	200–250
Sweet pepper	750–800	200–250

Potato

(1) Whole tubers: 15 to 22.5 qt/ha.
(2) Cut tubers: 15 to 20 qt/ha.

What have you learned?

Now, I am able to:

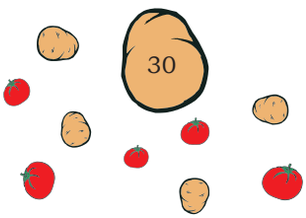
- explain the seed quality parameters.
- list important varieties of solanaceous crops.
- explain desirable characteristics of the produce for better marketing and export.

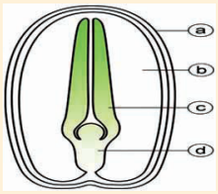
Practical Exercises

Activity 1: Identify the seed parts.

Material required: A picture showing seed parts, pencil or pen

Procedure: Label the parts of a seed.





Activity 2: Prepare a herbarium of seeds of vegetable crops.

Material required: Transparent sachet (small pouch), stapler, herbarium book and pen

Procedure:

- Collect small quantity of seeds.
- Weigh the seeds and count the total number of seeds.
- Fill them in a sachet.
- Label the sachets.
- Staple the sachet on individual pages of the herbarium.

Check Your Progress

Fill in the Blanks

1. In _____ type of tomato, the growth of plants terminates in the flower bud.
2. Pusa Sadabahar is a variety of _____.
3. Fruits of _____ variety of brinjal are long and green in colour.
4. The variety of potato suitable for processing is _____.

Multiple Choice Questions

1. Seeds can be defined as a dormant _____
   (a) embryo (b) ovule
   (c) ovary (d) fruit
2. Which of the following is not a part of a seed?
   (a) Seed coat (b) Embryo
   (c) Cotyledon (d) Ovary
3. Determinate type tomato comprises _____ varieties.
   (a) late (b) early
   (c) mid-season (d) all of the above
4. Which one among the following does not belong to determinate type tomato?
   (a) Vaishali (b) Rupali
   (c) Arka Saurabh (d) Rashmi
5. Which tomato variety is not an indeterminate type?
   (a) Arka Rakshak (b) Arka Meghali
   (c) Arka Samrat (d) Pusa Early Dwarf

6. Long fruited brinjal is _____.
   (a) Pusa Hybrid–6 (b) Pusa Hybrid–9
   (c) Pusa Upkar (d) Pusa Purple Cluster
7. Which of the following is a sweet pepper variety?
   (a) Pusa Jwala (b) Pant C–1
   (c) Andhra Jyoti (d) Arka Gaurav
8. Seed rate of pure variety of tomato is _____ g/hectare.
   (a) 400 (b) 200
   (c) 600 (d) 700

Descriptive Questions

1. What is seed? What are the different parts of a seed?

   _____
   _____
   _____

2. Which agencies in India are responsible for producing certified seeds?

   _____
   _____
   _____

3. Differentiate between determinate and indeterminate type of tomatoes.

   _____
   _____
   _____

4. Describe seed quality.

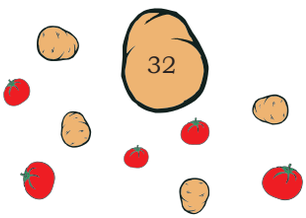
   _____
   _____
   _____

5. Give the seed requirement of solanaceous crops per hectare.

   _____
   _____
   _____

Match the Columns

Vegetable	Variety
1. Tomato	(a) Kufri Jyoti
2. Brinjal	(b) Arka Mohini
3. Chilli	(c) Pant C–1
4. Sweet pepper	d) Arka Kusumakar
5. Potato	e) Arka Meghali



Session 2: Nursery Bed Preparation and Seed Sowing

Nursery bed

A nursery bed is a small area where necessary soil and environmental conditions, such as germinating media, plant nutrients, water, temperature, oxygen and weather protection are provided for the germination and growth of seeds into healthy seedlings (Fig. 2.12).

Fig. 2.12: Nursery beds

Benefits of nursery bed

- convenient to look after seedlings
- cropping period gets reduced
- helps in better land and time management as seedlings preparation in nursery beds gives more time for the preparation of the main field
- helps produce uniform and healthy seedlings

Method to prepare nursery or raised beds

- Prepare 15–20 cm raised beds. The width should be between 0.45 and 1.20 m, whereas, the ideal length ranges from 3 to 5 m.
- This enables drainage during rains and avoids water stagnation.
- The nursery bed is thoroughly mixed with 10–15 kg of decomposed farmyard manure per square metre.
- All weeds, stones, stumps, clots, etc., are removed from the field and the bed should be levelled.
- The seeds are sown in lines in the bed.
- To carry out cultural practices, the space between two beds should be 30–40 cm.

Preparing the site for seed bed

The selection of a site for creating a nursery bed depends on the following factors:

- sunny location
- availability of a water source nearby
- fertile and sterlised soil

Soil sterilisation

Nursery plants are prone to many soil-borne infections and infestations. The soil of the nursery should, therefore, be sterilised. The soil can be sterilised by the use of chemical, physical or biological sterilisers.

Chemical steriliser

Fumigants, like formaldehyde, chloropicrin, methyl bromide and vapam are used for sterilising of soil. These chemicals are mixed with water and spread over the area. The soil is, then, covered with polyethylene sheets for 2–3 days. After 2–3 days, the sheets are removed and the beds are prepared after seven days. This treatment will kill all weeds and microorganisms present in the soil.

Fungicides, like *Carbendazim* and *Copper oxychloride*, are used to inhibit soil-borne fungi. Fungicide solutions are poured or sprayed on the soil uniformly.

Insecticide, like *Chlorpyriphos*, is also used to kill insects present in the soil. Approximately, 2 litre of *Chlorpytiphor* is mixed with 1 litre of water and is applied to a depth of 15 to 20 cm in the soil to kill insects, including ants and their eggs, nematodes, etc.

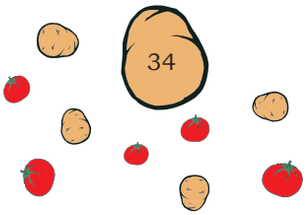
Physical steriliser

The soil and sand used for the preparation of the bed can be sterilised in an autoclave at 121 °C for 30 minutes. This will kill almost all weeds and microorganisms present in it. It is difficult to execute the process on a large scale as certain beneficial factors may get lost from the soil.

Mostly, soil solarisation, i.e., solar energy, is used as a method to sterlise the soil.

Bio-agents

- Certain biological agents, like *Trichoderma* species, are effective in controlling soil-borne pathogens.
- These bio-agents are mixed well in soil, say 10–25 g/square metre.
- Seeds should be sown 2–3 days after the application of a bio-agent.



Seed treatment

Hot water treatment

Dry seeds are placed in water having a temperature of 48–55 °C for 10–30 minutes prior to sowing. This reduces seed-borne inoculums.

Chemical treatment

Seed treatment with fungicides, like *Thiram* at the rate of 3 g/kg or *Carbendazim* at the rate of 2 g/kg, is done to prevent fungal attack on seeds. Similarly, insecticides, like *Imidacloprid* 70% WS at the rate of 7 g active ingredient per kg of seed, can be used for the protection of seeds against insects and pests. The seeds are shaken with the chemical in a closed container or seed treating drum, so that each seed gets pelleted with the pesticide. In another method, the seeds are kept in a pesticide solution for specific a period prior to sowing.

Biological seed treatment

Some bio-agents are used for seed treatment to control seed and soil-borne inoculua, such as *Trichoderma haerzianum*. For the improvement of germinability and production of leguminous crop, seeds are treated with biofertilisers, like *Rhizobium* species.

Sowing on seed bed

Line sowing

Seeds are sown in lines on a seed bed. The depth of sowing is usually 1.5–2 cm and the ideal spacing between the lines is 5–7 cm. The fine seeds should be mixed with sand for uniform distribution. After sowing, the lines are filled with sieved compost or the leaf mould, and the bed should be covered with dry grass till germination. Irrigate the beds daily with the help of a watering can.

Seed sowing in pro-trays

Pro-trays are filled with the growing medium, which is prepared by mixing coco peat, vermiculite and perlite in 3:1:1 proportion (Fig. 2.13). Coco peat is obtained from the coir industry as a by-product. One seed is sown

Fig. 2.13: Seeds sown in pro-trays

per plug. Small depressions (0.5 cm) are made at the centre of the plugs with fingertips or mechanical tools for the sowing of seeds. The seeds are then covered with the medium. Arrange the pro-trays one on the other to enhance the temperature, which will help in germination. When germination starts, the pro-trays are separated and watered with a watering can.

Factors affecting seed germination

Temperature

Almost all solanaceous crops cannot withstand frost. Seeds cannot germinate at a low temperature. Temperature range of 13 to 21 °C is favourable for seed germination.

Moisture

Moisture is of prime importance in initiating germination in a seed.

Sowing time

The time of sowing a seed (Table 2.2) or plant a particular species in the open determines the success or failure of a crop to a considerable extent. The planting time should be determined by taking into consideration the soil and weather conditions, the kind of crop, and the time when the produce is desired for vegetable purpose.

Depth of sowing

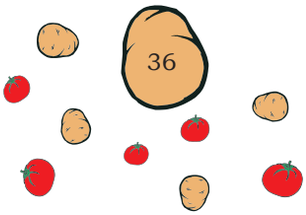
Small seeds if sown deep in the soil fail to germinate. The depth at which a seed has to be sown in decided according to its size. The seeds of solanaceous crops are small in size and can be sown up to a depth of 2 cm. The seeds, if sown shallow, may be picked up by birds.

Seed coat

Sometimes, the germination of a seed is inhibited or delayed due to the presence of a hard seed coat. In such cases, the seed coat is broken or softened by various methods, like soaking the seed in water or acid or rupturing the seed coat mechanically.

Seed viability

The capability of a seed to germinate and produce normal seedlings is known as 'seed viability'. Seed viability



is not retained indefinitely and the seed, gradually, deteriorates and dies due to ageing. The viable period of a seed varies from crop-to-crop and even on variety within a crop.

Seed dormancy

Usually, potato seeds show dormancy due to which they do not germinate. The treatment of thio-urea or dipping of tuber in a solution of *Gibberellins* at 0.5–1 ppm reduces dormancy.

Seed pests

Insects, pests and mites in storage are responsible for damaging the seed structure by biting or chewing the seeds.

Seed diseases

The association of certain bacteria and fungi shorten seed viability, and thus, affect germination.

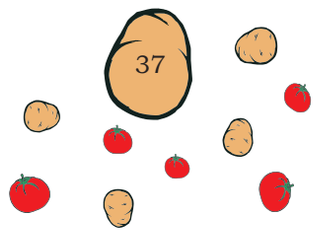
Table 2.2: Timing of sowing solanaceous crops

S. No.	Name of the crop	Sowing time
1.	Tomato	June–July (for *Kharif* crop) September–October (for *Rabi* crop) December–January (for summer crop)
2.	Brinjal	June–July (for *Kharif* crop) September–October (for *Rabi* crop) December–January (for summer crop)
3.	Chilli	June–July (for *Kharif* crop) September–October (for *Rabi* crop) December–January (for summer crop)
4.	Potato	First fortnight of October (for early crop) October mid–November (for main crop)

Soil nursery

Advantages

(a) It helps reduce the wastage of small and expensive hybrid seeds due to better care in a nursery.
(b) The germination per cent is high in nursery beds as compared to direct sown crops.
(c) The nursery area is small, hence, seedlings can be managed in a better way with minimum care and cost.



(d) By selecting vigorous and healthy seedlings in a nursery for transplanting, better and uniform crop growth can be obtained in the main field through better survival chances.
(e) It helps reduce crop duration in the main field by at least a month, which saves both land and labour.
(f) Controlling insects, diseases and weeds is easy during the initial stage.
(g) Nursery raising reduces the overall crop period and favours early maturity.
(h) It provides employment opportunities for skilled, semi-skilled and unskilled human resources.

Disadvantages

(a) In comparison to pro-tray technique, more seeds are required in a nursery.
(b) Seedlings may get injured during uprooting, so irrigate the beds just before uprooting.
(c) Chances of soil-borne infections are more, if soil treatment is not done carefully.
(d) Chances of loss due to rodents are more. To avoid such a situation, carefully select a site.
(e) Seedlings may grow dense, which affects the growth of plants. Hence, line sowing and thinning can be done.
(f) A nursery requires more watering and intercultural operations for healthy seedlings.

What have you learned?

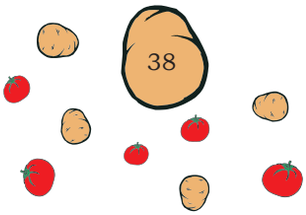
Now, I am able to:

- understand the importance of a nursery bed.
- learn the process of a nursery bed preparation.
- explain the factors affecting seed germination.
- explore various methods of seed sowing.
- explain the advantages and disadvantages of soil nursery.

Practical Exercises

Activity 1: Demonstration of the procedure for the preparation of a nursery bed

Material required: Spade, pick axe, *khurpi*, rake, black polythene sheet, watering can, 2% formalin or formaldehyde solution and measuring cylinder of 100 ml capacity



Procedure

- Level the seed bed.
- Wear mask and gloves.
- Prepare 2% formalin or formaldehyde solution by mixing 40 ml formalin of 48% purity in 1 litre water for fumigation of the soil.
- Treat the seed bed the with 1% formalin solution at the rate of 3–5 litre/sq. m by drenching the soil with the help of a water can.
- Cover the treated soil with a black polythene sheet so that the fumes do not vapourise.
- Remove the black polythene sheet after 48 hours.
- Expose the fumigated soil for at least seven days before sowing the seed.
- Prepare the seed bed of 15–20 cm height and 45–120 cm width.

Precautions

- Mask and gloves should be worn before starting fumigation.
- Fumigation of the soil should not be done on a windy day.

Activity 2: Study seed germination

Material required: Seeds, watering can, pots filled with medium

Procedure

- Take a seed sample.
- Refer to the seed germination standard of a crop to know the quality of the seeds.
- Take counted number of seeds for testing. Sow the seeds in a pot filled with growing medium.
- Cover the seeds with soil.
- Water the pot.
- Keep the pots under optimum conditions for the germination of seeds.
- After germination, count the seedlings that have emerged.
- Calculate the seedling germination by dividing the number of seedlings emerged by the total number of seeds sown multiplied by 100.

Check Your Progress

Fill in the Blanks

1. All solanaceous vegetables except _____ are transplanted crops.
2. The _____ beds are prepared 15–20 cm high from ground level.
3. The width of a raised bed should not be more than _____ m.
4. In _____ method of soil treatment, the energy from the Sun is used.

5. Certain biological agents, like _____, are effectively used for controlling of soil-borne pathogens.
6. Temperature range of _____ is found favourable for the germination of seeds of solanaceous crops.
7. The depth of sowing solanaceous crop is usually _____ cm in a nursery bed.
8. The spacing of sowing solanaceous crop seeds is _____ cm.
9. A by-product of the coir industry, which is a part of the germination medium, is known as _____.

Multiple Choice Questions

1. Raised beds are _____ cm high from the ground level.
   (a) 5–10 (b) 15–20
   (c) 25–30 (d) 30–35
2. A space of _____ cm is left between two beds.
   (a) 30–40 (b) 20–25
   (c) 15–20 (d) 20–25
3. The soil is sterilised in an autoclave at _____°C for 30 minutes.
   (a) 100 (b) 140
   (c) 121 (d) 80
4. In hot water seed treatment, seeds are placed at a temperature of _____ °C for 10–30 minutes.
   (a) 48–55 (b) 30–35
   (c) 20–25 (d) 15–20
5. Fungus used for seed treatment to control seed and soil-borne inoculums is _____.
   (a) *Trichogramma* (b) *Trichoderma*
   (c) *Rhizopus* (d) *Rhizobium*
6. The capability of a seed to germinate and produce normal seedlings is called _____.
   (a) seed vitality (b) seed viability
   (c) seed dormancy (d) compatibility

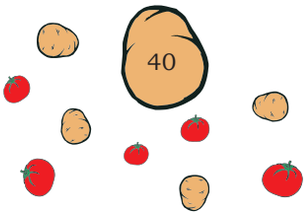
Descriptive Questions

1. What is a nursery bed? How is it prepared?

   _____
   _____
   _____

2. How the soil for a seed bed can be sterilised chemically?

   _____
   _____
   _____



3. Why is seed treatment followed before sowing?

_____

_____

_____

4. Describe soil sterlisation.

_____

_____

_____

5. How is the medium for pro-trays prepared?

_____

_____

_____

6. List the factors which affect seed germination.

_____

_____

_____

7. Describe the advantages and disadvantages of soil nursery.

_____

_____

_____

Match the Columns

1. Bio-agent	(a) Protection to seedling during high wind
2. *Thiram*	(b) *Trichoderma*
3. Sunken beds	(c) Chemical for soil sterilisation
4. Formalin	(d) Seed treatment

Session 3: Nursery Raising in Soilless Medium

Pro-trays

Pro-trays are made of soft plastic with shallow plugs, in which seeds are sown in soilless germination medium (Fig. 2.14).

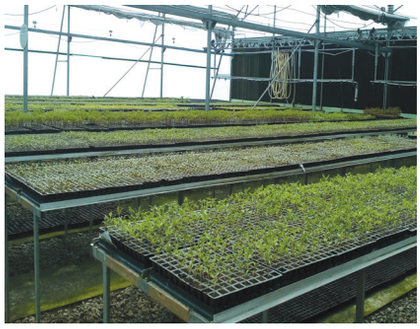


Fig. 2.14: Seedlings in pro-trays

Selection of pro-trays

The most common pro-trays used for vegetable transplants have 50, 72, 98, 128 or 200 cells per tray.

The cells in these pro-trays are round or square in shape and are close to each other. However, they are equally spaced in order to maximise the number of plants in a tray. For larger crops, like pumpkin, bitter gourd, etc., there are pro-trays having 36 or 24 cells of larger size. The bigger size of cells allows larger root balls.

The size of a cell influences the field performance of the transplant. When bigger cells are used, the plant has more space to grow and it results in the early maturity of crops. Dark coloured trays absorb more heat and tend to produce faster growth than light coloured ones. A deep celled tray has a larger cell volume, and it retains more water and fertilisers to promote rapid growth.

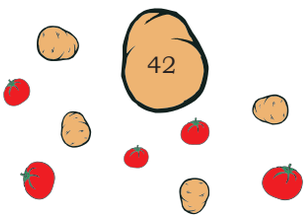
Nursery technique under protected cultivation

The growing medium is prepared by mixing 5 kg neem cake, 100 kg vermiculite or perlite, and 300 kg sterilised coco peat. For filling one pro-tray, approximately 1.2 kg of growing medium is required. About 238 pro-trays (with 98 cells per tray) are required for the production of 23,334 seedlings. These seedlings are enough for planting one hectare land. Trays with the medium is compressed or 'dibbled' to make a uniform surface for the seed. The medium should be compressed from 1/4 to 3/8 inch deep. One treated seed must be sown in each cell of the pro-tray. The seeded trays are, then, covered with medium-grade vermiculite. Vermiculite is preferred because of better aeration and it does not support algae. The trays are covered with a polythene sheet till germination starts. Place the pro-trays separately on a raised bed in the shade net. Water the trays with rośecan every day and drench with foliar spray formulation having Nitrogen, Phosphorous and Pottasium (N, P and K) in the ratio of 19:19:19 at the rate of 0.5% (5g/l) 18 days after sowing.

Planting in pro-trays

Advantages

(a) More efficient use of expensive hybrid seeds.
(b) Individual seeds can be sown in each plug, which minimises the spread of diseases.



(c) Sterilised coco peat is used as the rooting medium, which reduces chances of soil-borne infections.
(d) Water holding capacity of coco peat is more so seeds in pro-trays require less watering.
(e) Transplanting shock is minimised.
(f) Seedlings can be uprooted easily for transplanting without any damage to the root system.
(g) Pro-trays can be moved easily to protect the seeds from adverse weather conditions.
(h) It needs less space.
(i) It fosters better and uniform plant growth.
(j) More cycles of nursery production is possible as seedlings can be prepared many times as compared to field conditions.
(k) A field or a part of the field or greenhouse is not engaged in the raising of seedlings.
(l) Individual seedlings get their own space and chances of high density are minimised.
(m) It facilitates better care and management of seedlings.
(n) There is no waterlogging.
(o) Weeding and thinning is easily carried out in pro-trays.
(p) Uniform transplants and transplanting can be mechanised.

Disadvantages

(a) It requires skilled labour.
(b) It requires special care and maintenance.
(c) Pro-trays are costly and difficult to dispose of.
(d) The use of pro-trays increases plastic waste in an agricultural farm.
(e) Pro-trays require coco peat as a growing medium, which is costly.
(f) The cost of seedling production is high, which increases the overall cost of production.

Depth and spacing for seed sowing

Soil nursery

Seeds of tomato, brinjal and chilli are small in size and light in weight. While planting on a nursery bed, the seeds are mixed with sand for uniform distribution on the bed. The seeds are sown width-wise in lines drawn

with sticks 5–7 cm apart. The seeds are sown at a depth of 2 cm and covered with soil.

Pro-trays

Sowing in pro-trays is shallow than in seed bed. In a plug filled with coco peat, make a depression of 0.5 cm with the help of your fingertips or mechanical dibbler and place one seed in each plug. Cover the plugs with coco peat.

What have you learned?

Now, I am able to:

- select pro-trays.
- germinate seeds of solanaceous crops in pro-trays in protected cultivation.
- explain the advantages and disadvantages of planting in pro-trays.

Practical Exercises

Activity 1: Preparation of pro-trays and sowing of seeds

Material required: Coco peat, neem cake, vermiculite, perlite, pro-trays, seeds, watering can, polythene sheet, etc.

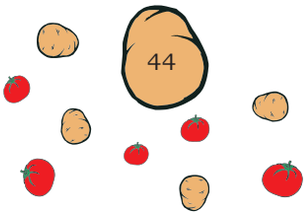
Procedure

- Prepare a growing medium by mixing coco peat with neem cake, vermiculite and perlite in 3:1:1 proportion.
- Fill the cell of pro-trays with the growing medium.
- Make small depressions (0.5 cm) in the centre of the plugs with fingertips or mechanical dibbler.
- One seed is sown per cell (plug) in the depression made in the plug.
- The seed is then covered with the medium.
- Ten pro-trays are arranged one on the other for better germination of seeds.
- Observe the seeds for the start of germination.
- Spray water with a rośecan in the pro-trays daily till the seeds attain the transplanting stage.

Check Your Progress

Fill in the Blanks

1. For pumpkin, pro-trays with _____ cells per tray are used.



2. Big size cell influences the _____ of the crop.
3. When bigger cells are used, the plant has more _____ to grow.
4. Dark coloured pro-trays tend to cause faster growth than _____ coloured trays.
5. About _____ pro-trays (98 cells/tray) are required for seedling production for one hectare.
6. The _____ allows good aeration to pro-trays.
7. Vermiculite does not support _____ growth in the tray.
8. Pro-trays are made of soft plastic with shallow _____.

Multiple Choice Questions

1. Pro-trays growing medium has vermiculite because _____.
   (a) it is easy to apply evenly
   (b) it has good aeration
   (c) it does not support algae
   (d) all of the above
2. Coco peat _____.
   (a) is sterilisable
   (b) is light in weight
   (c) has good water holding capacity
   (d) all of the above
3. Approximately _____ kg of coco peat is required for filling one pro-tray.
   (a) 1.2 (b) 2
   (c) 2.2 (d) 3

Descriptive Questions

1. Why do we raise nursery in pro-trays?
   _____
   _____
   _____
2. Which medium is used for filling pro-trays?
   _____
   _____
   _____
3. What is the significance of vermiculite used in the planting of a crop in pro-trays?
   _____
   _____
   _____

Notes

4. Write down the procedure of sowing seeds in pro-trays.

_____

_____

_____

5. What are advantages and disadvantages of planting seeds in pro-trays?

_____

_____

_____

6. Write the criteria for the selection of pro-trays.

_____

_____

_____

7. Write about pro-tray nursery technique for solanaceous vegetables under protected cultivation.

_____

_____

_____